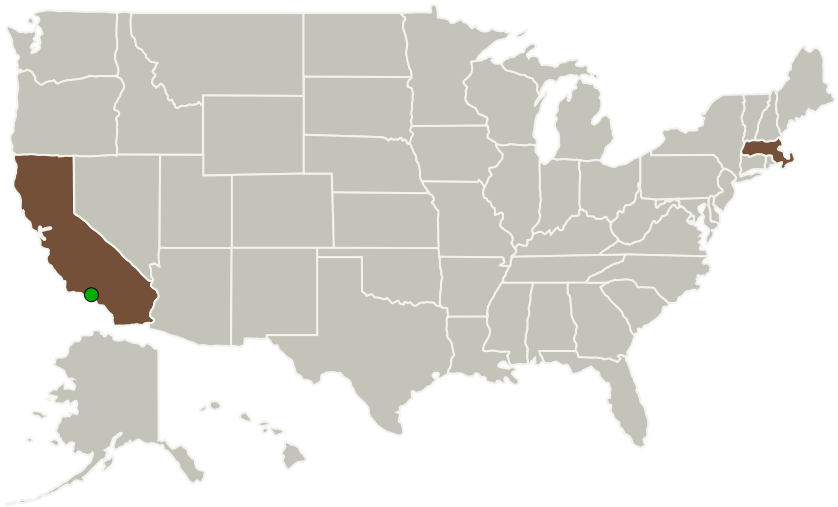
Innovative Deterministic Optical Surface Finishing, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Increasing the optical surface finishing precision and reducing surface roughness will greatly benefit astronomy telescope and other optical systems. Conventional optical finishing only delivers about 1/10 lambda surface flatness and is hard to handle arbitrary surface shape. To finish optical surface with low cost to an ultra high precision and to reach the capability of generating arbitrary surface shape such as the aspherical surfaces or special patterns, in this proposal, we propose the development of an innovative computer-controlled optical surface finishing system. We suggest using chemical reactive removal as the tool to remove the material on the optical surface, controlled by computer with a deterministic removal algorithm. In phase I, a prototype system with ultra high precision finishing capability, ~ 1/100 lambda (632.8nm) for surface figure and ~1/1000 lambda for RMS will be demonstrated. A 5~10 times improvement in surface roughness is expected over the current technique as the chemical removal is at the atomic or molecular level, rather than by particle bombardment on optical surface. The lower surface roughness will obviously reduce the scattering lose for the short wavelength range. In Phase II, we will extend the work to non-flat surfaces, ie, arbitrary shaped surfaces, and to other glasses and materials of interest to NASA.

Primary U.S. Work Locations and Key Partners



Innovative Deterministic Optical Surface Finishing, Phase I

Table of Contents

Innovative Deterministic Optical Surface Finishing, Phase I

Completed Technology Project (2011 - 2011)

Organizations Performing Work	Role	Type	Location
AGILTRON Corporation	Lead Organization	Industry	Woburn, Massachusetts
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138656)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

AGILTRON Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

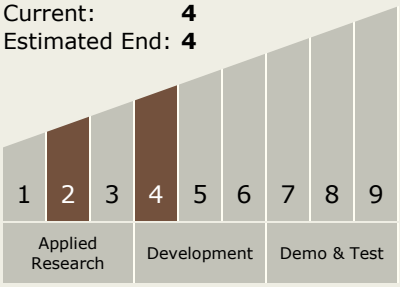
Carlos Torrez

Principal Investigator:

Alexander Mazurenko

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Innovative Deterministic Optical Surface Finishing, Phase I

Completed Technology Project (2011 - 2011)

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.1 Optical Communications
    - TX05.1.6 Optimetrics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System